CHAPTER 4: TRAINING

The ADT staff who are operating the fruit-tree nurseries in Afghanistan will be undergoing training in Peshawar during the winter. Since they are to expand their nurseries to include forest species, their training will include the following:

- The management of a forest-tree nursery;
- Silviculture of cold-climate species: Persian pine, honey locust, and black locust;
- Silviculture of species for Helmand: Acacias, other legumes, eucalypts, casuarina;
- Social forestry: involving the local community in tree planting and in soil conservation;
- Entomology of poplar insects;
- Fuel-efficient stoves;
- Watershed management;
- Rootfuels; and
- Other economic forest plants.

Training specialists of ADT, selected from the areas of forestry, entomology, technology, and sociology from the Forest Institute, the Forests Department, and various NGOs, will conduct the training program.

CHAPTER 5: RESOURCE PEOPLE FOR TRAINING

(See also Appendix XI.)

1. **PAKISTAN FORESTS INSTITUTE** 40580
   Dr. M. Ismail Chaudhry, Forest Entomologist (Willing to present information on poplar insects).

   Raja Walayat Hussain, Silviculturist

   Professor Anwar Ahmed Khan, Medicinal Plants

2. **PAKISTAN FORESTS DEPARTMENT** 78674
   Yaryah M. Khan, Chief Conservator (Can arrange a short course in nursery management.)

3. **MADERA** 42234
   Olivier Cossee (Has extension material applicable to forest management).

4. **SARHAD RURAL SUPPORT PROJECT** 73731
   Javed Majid (and others) (Willing to explain their program to the trainees.)

5. **GTZ DOMESTIC ENERGY SAVING PROJECT** 45417 and
   PAK-GERMAN FUEL EFFICIENT TECHNOLOGIES PROJECT 42511
   Cornie Huizinga, Maryam Bibi, Wilfried Herrich, Philip Appleton and many others will share their skills in technology and in training.

6. **MALAKAND SOCIAL FORESTRY PROJECT**
   Jan Helsen, Johan Niewenhuis and Zarnigar Tayyib
   Box 9, Saidu Shariff 0536-5786) (Will welcome a field trip to their program).

7. **GTZ PAK-GERMAN INTEGRATED RURAL DEVELOPMENT PROJECT**
   Helmut Irle, Project Coordinator.
   Box 61, Charsadda Road, Mardan 0531-62653

8. **SERVE** 5 Mulberry Road Phone 41706
   Herman Nyhoff, Forester (Small private nurseries)

Appendix I: CLASSIFICATION AND NATURAL DISTRIBUTION OF WOODY PLANTS IN AFGHANISTAN

The vegetative types described below are based, for the most part, on the work of Professor S. T. Nedialkov in 1973; observations by other botanists are added for some of the higher zones. The types described are considered **climax** associations; but because of major interference by overcutting and overgrazing, some of the types are only scattered remnants.

The associations are shown clearly on Nedialkov's map, "Carte Ecologique de la Vegetation Ligneuse Naturelle de l'Afghanistan."

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
1	**CALLIGONUM** 6 spp of Calligonum	Semidesert of South & along Oxus River	>1000	>150
Economic importance: Stabilizing sand.				
2	**HALOPHYTES** Salsola sp. & holophytic herbs	Salty soils of West & Southwest	>500	>150
3	**HALOXYLON** 3 spp of Haloxylon	Southwest, dry, sandy, with dunes	>1000	>150
Importance: Protecting sand from wind erosion.				
4	**TAMARIX** Tamarix, sp.	Desert Southwest	>500	>150
Importance: Tamarix is valuable for reforestation in dry climates. T. stricta and T. articulata will grow as trees.				
5	**ZYGOPHYLLUM** Zygophyllum, Salsola, Artemesia	South Southwest, dry soils	>1000	>150
Importance: Pasture and soil protection.				
6	**ARTEMISIA STEPPE** Artemisia, Astragalus & grasses	Large part of South SW and North. Frequently cultivated.	1000	>150
Importance: Cultivated land (irrigated); also pasture.				

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
7	**LOWER AMYGDALUS** A. eburnea, A.ebrahuica, A.erioclata	West to Southwest semidesert	900-1200	150-250
	Importance: Amygdalus species will grow in this difficult environment without irrigation and should be encouraged for soil protection. Also valuable winter pasture.			
8	**PISTACIA ATLANTICA** P. atlanticum, P. khinjux, Astragalus, Ephedra, grasses	East; Central	1200-1800	250-400
	Importance: Pistachio as a cash crop. Will need protection from grazing.			
9	**UPPER AMYGDALUS** A. communis, A. kuramica, Fraxinus xantholoides, Rosa, Cotoneaster, Cerasus, Colutea, Cercis, Artemisia Astragalus, Acantholimon, Cousinia, Salvia bucharica, and bulbs	East, South, and West (Best pastures)	1800-2800	400- 600
	Importance: Best pastures here. Amygdalus is valuable for erosion control here. A good site for cultivated almonds.			
10	**PISTACIA VERA** P. vera, Amygdalus buharica, A. spinosissima, Cerasus, Artemisia, Cousinia, Phlomis, Salvia, grasses	North	600-1800	300-600
	Importance: Extremely valuable source of cashew nuts as cash crop. Will require management.			
11	**JUNIPERUS** J. excelsa (NW); J. seravschanica & J. semiglobosa (NE); Crataegus, Pyrus, Malus, Ephedra, Lonicera, Cotoneaster, Cerasus, Rosa Acantholimon, Artemisia, Astragalus, grasses, bulbs	North; NE; NW	1800-3200	600-1100
	Importance: Soil protection and timber supply. This zone also could be afforested with other conifers.			

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
12	**DRY SUBTROPICAL** Withania, Rhazya stricta, Z. nummu-aria, Calotropis, Dodonea viscosa, Dalbergia, Pistacia khynjux, Periploca, Ephedra, Nerium	Valleys of Kabul and Konar Rivers	580-850	180-320

Importance: Zone for Tamarix without irrigation. With irrigation a good location for citrus fruit.

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
13	**OLEO/REPTONIA** O. ferruginea, R. buxifolia, Calotropis, Acacia Modesta, Quercus baloot	Konar; Paktya	850-1300	320-400

Importance: Soil protection; source of firewood and timber. Also opportunity to graft domestic olive (Olea europaea) onto the native O. ferruginea.

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
14	**QUERCUS** Q. baloot, Pinus, Indigofera, Sophora, Daphne, Pinus, Amygdalus, Cedrus, Corylus, Diospyrus	Konar: Paktya:	1300-2100 1300-1800	400-700 400-600

Importance: Soil protection (originally); timber, firewood, browse; winter protection of animals under the trees.

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
15	**PINUS GERARDIANA** P. gerardiana, Q. baloot, Cedrus, Sophora, Astragalus, Artemisia, Acantholimon	Paktya	1800-2300	600-780

Importance: Though severely overcut, the "Forests of Jalghosa" are valuable for erosion control as well as timber, nuts, and resin.

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
16	**CEDRUS** C. Deodara, Pinus excelsa, Q. baloot, Q. dilatata, Abies webbiana, Picea morinda, Juglans, Vitis, Amygdalus communis, Aesculus, Indigofera, Sophora, Daphne	Konar: Paktya:	2100-2500 2300-2800	700-860 780-960

Importance: Soil protection; construction timber (also resin).

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
17	**ABIES/PICEA** A. webbiana, P. morinda, Pinus excelsa, C. deodara, Q. semicarpifolia, Taxus baccata, Padus corunta, Aesculus, Indigofera, Sambucus, Daphne, Cotoneaster, Juniperus	Konar: Paktya:	2500-3300 2800-3300	860-1100 960-1100

Importance: "Most important source of wood in Afghanistan."

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
18	**SUBALPINE** Picea morinda, Juniperus spp., J. communis, Astragalus, Onobrychis, grasses in the North and East. In the Central area only shrubs: Astragalus, Onobrychis, Acantholimon, Cousinea, Artemisia, Rhamnus, Rosa, etc. (and bulbs).	East: North: Central:	3300-4400 3200-3500 2800-3500	1100-1200 1100-1200 600-700

Importance: Soil protection; pasture.

MAP No.	TYPE NAME with Main Species	LOCATION	ELEV. (METERS)	PRECIP. (MM)
19	**ALPINE** Astragalus, Acantholimon, etc. Also Rhododendron afghanicum	East: North: Central:	>4000 >3500 >3500	>1200 >1200 >700

Importance: Valuable protector of water sources.

References:

1. S.T. Nedialkov, 1973: ETUDE SUR LA CLASSIFICATION ECOLOGIQUE DE LA VEGETATION LIGNEUSE NATURELLE EN AFGHANISTAN. UNDP/FAO/AFG 67/515.

2. Khan, M.I.R. and A.R. Beg, 1968: A PHYTOGEOGRAPHICAL EXCURSION IN AFGHANISTAN.

Appendix II: GRASSES IN WATERSHED MANAGEMENT

Overgrazing and, to a lesser extent, over-cutting have led to the disappearance of many valuable fodder grasses on the hills of Afghanistan.

Fields are used in two general ways: either for **pasture** or for **hay**. There may also be nearby plots (usually irrigated) which produce clover and alfalfa which is cut and carried to livestock. Some plots of wild hay are similarly harvested by hand. Such hayfields may be grazed at certain times, with grazing scheduled so that it will not interfere with hay production.

Grazing areas do not receive the control accorded to **hayfields**. Annual grasses and forbs are not allowed to reseed; perennial plants are browsed to death and thorny, unpalatable, or toxic plants become dominant. Shrubs which indicate severe overgrazing are *Artemisia*, *Cousinia*, *Acantholimon* and *Onobrachis*. Unpalatable grass species, *Cymbopogon* and the rough *Sacharums* (at lower elevations), may still be present. (Dr. Beg has a specimen of *Cymbopogon jwarancusa* which has grown into a defensive thorny sphere.)

Two local species of grass recommended are sabah or spin warghe (*Chrysopogpn aucheri*) and lung (*Themeda anthera*). Even the speargrass, surmal (*Heteropogon contorta*), is a good source of hay when harvested young.

Four other species of grass are recommended for nurseries to provide as cuttings or seed for reclaiming eroded hillsides: mala, *Panicum antidotale*; dardam, *Sorghum almum*; napier grass, *Pennisetum purpureum*; and buffel grass (also sometimes called spin warghe), *Cenchrus ciliaris*. Buffel grass seed or cuttings for planting should be selected from local sources.

In the Helmand Valley, the situation is quite different. *Saccharum spontaneum* colonizes areas of sand and soil left by receding annual floods, so is a good sand binder. *Cenchrus ciliaris*, *Eleusine*, *Panicum*, *Elionorus*, *Oryzopsis* and *Pennisetum orientale*, all good forages, should be encouraged to help control sand drift.

Improving the vegetative cover of a degraded hillside will involve the following steps:

- Seeding or planting cuttings of suitable species;
- Fertilization, if possible;
- Grazing control; and
- Brush control. If an area is suitably managed for forage production, it makes sense to see that the vegetative cover contains species edible for livestock.

The carrying capacity of an area must next be calculated. A cow (considered one animal unit), requires approximately 9 kg of feed per day. A buffalo is 1.3 - 1.5 animal units; a sheep is .2 animal units; and a goat .3 animal units.

The production of browse, forbs, and grass can be measured or predicted, using annual rainfall as a basis. If the rainfall is between 8-12 inches, a hectare can produce only 224 kg of forage; that would require 11 hectares to support one cow. A cow can be supported on 2 hectares in an area where the rainfall reaches 24 inches.

Controlled grazing is perpetually required to ensure the success of a managed hillside. Fortunately, controlling the time and intensity of grazing and browsing enables an area to produce much more feed than does uncontrolled overgrazing. Under controlled grazing, the plants (with their expanded leaf surface) increase in size and productivity, rather than constantly losing their stored reserves.

Protecting an area from continuous grazing may also allow dormant and inconspicuous grass seed to germinate and survive.

Appendix III: SUPPLEMENTARY FOREST PRODUCTS

In addition to timber and fuelwood, the forest lands of Afghanistan produce other crops of economic value. Some of these crops have been neglected because of the war. In all cases such crops should, in the future, be carefully managed to avoid depletion.

1. **Pistachio,** Pistacia vera, from western Afghanistan is valued in the world market because it has a darker green color than other species. There are several other species of pistachio growing wild in Afghanistan and nearby Pakistan, but the dark, green one commands the highest prices. As recently as 1988, Afghanistan exported as much as 1,200 tons of pistachios to India, with a value exceeding a million dollars.

2. **Pinenut** is a product of the Himalayan nut pine, Pine gerardiana, which is found on both sides of the border with Pakistan. The nuts are welcome in the world market, but apparently more attention could be given to them. In 1982, Pakistan spent only Rs 30,000 for pinenuts. There are reports that some of the trees in Afghanistan are being cut for lumber.

3. **Licorice** from the root of Glcyrrhizia glabra is exported with an annual value of nearly three million dollars.

4. **Asa foetida,** a gum from the umbelliferous Ferula foetida, is another valuable export crop, with India importing up to a value of two million dollars a year. In spite of its reputedly foul odor, the extract is used (in tiny amounts) to flavor curries and as an ingredient in medicines.

This short compilation does not go far into the wide range of medicinal plants. In Pakistan there are fifty species of wild plants, from acacias to violets, each of which produces over fifty tons annually.

Appendix IV: ROOTFUELS

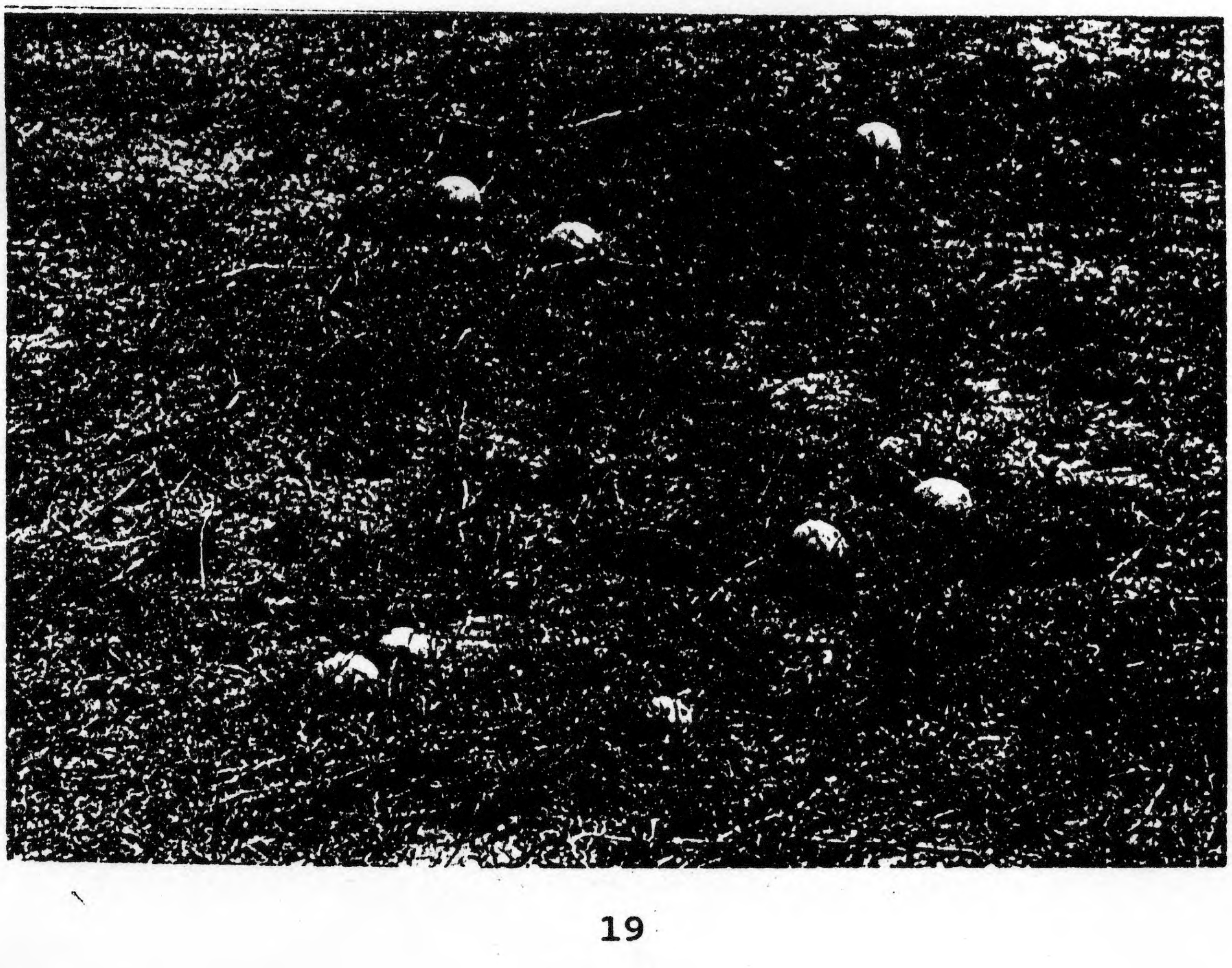
ADT is cooperating with Winrock International in investigating the utilization of the dried roots of cucurbitous plants as fuel.

The plants receiving the most attention are the **buffalo gourd**, Cucurbita foetidissima, of North America and the Asian **wild melon** or **colocynth**, Citrullus colocynthis (known in Pushto as managhoni, and in Farsi as terbozai abujail).

In test plots in the United States, the buffalo gourd has produced 11,000 pounds of dried root on one hectare in one season. If similar results are possible in fuel-deficient Afghanistan, it should be promoted.

The local colocynth also produces a starchy root. Project staff, along with Dr. A. R. Beg of P.F.I., collected many kilos of the root which were then dried and tested for combustibility. The roots were 80% water, and when dried were burned as a cooking fuel. Colocynth grows wild in Pakistan and Afghanistan in sandy areas that receive eight inches of rainfall and where winter temperatures are not much below freezing. Buffalo gourd requires ten inches of annual rain and will withstand colder winters than will colocynth. It prefers well-drained soils.

Trial plots of both species were planted in October by Dr. Beg in sandy soil at Azakhel, east of Peshawar. Herman Nyhoff, a forester with SERVE, is also planting test plots of buffalo gourd at his Peshawar nursery. ADT staff will establish test plots in Afghanistan in March of 1991.



AGROFORESTRY IN AFGHANISTAN

CHAPTER 1

INTRODUCTION

The shortages of wood for **fuel** and for **construction** are more acute in some provinces of Afghanistan than in others. The most serious shortages of building materials are near the Pakistani border where poles are needed for the rebuilding of houses destroyed in the war.

Firewood is always a concern. Although there are few precedents for planting trees specifically for fuel, there is a need to grow fuelwood species. Species of trees for hedges and windbreaks are suggested as well. A third, serious problem is the accelerated **erosion** of hillsides caused by deforestation and overgrazing.

It is easier to train communities in the technical aspects of tree-growing than it is to **involve the people** in the protection of the individual trees, plantations, and over-grazed range (or forests). Field staff need special training in offering constructive help to communities with this growing problem.

Cooperation with other agencies involved in similar work will continue to be a part of the program, and training courses and training materials will be shared. The promotion of fuel-efficient stoves is another area where cooperation is needed.

ASSP/PSA has Afghan field extension staff working in ten provinces of Afghanistan. In four of the provinces, Ghazni, Wardak, Logar and Kandahar, there are seven fruit-tree nurseries. It is in these nurseries and their surrounding areas that the agroforestry project is undertaken. Additionally, the agronomist in the Helmand Valley will add tree production to his program. Eventually an agroforestry component will be added to the ADT site in Nangarhar.

The nurseries will produce plants for living orchard hedges and will expand to produce other tree species. Smaller nurseries in Helmand will produce trees for poles and firewood.

The six functioning ADT nurseries in **Logar, Ghazni and Wardak** provinces lie between **2000 and 2300 meters** above sea level. This vegetation zone, called the Upper Almond Zone, has an annual **rainfall** of **400 to 600 mm** which falls primarily in the winter and spring. The winters are **cold**. The zone is excellent for pasturage, but is severely overgrazed. The native ash, *Fraxinus xanthoxyloides*, was here originally.

The advantage of growing leguminous plants, including trees, is that their root nodules are able to convert nitrogen to usable nitrates essential to plant growth. Thus if one had the choice between planting a legume tree and a non-legume, the legume tree should be chosen. A few trees other than legumes also have the ability to fix nitrogen. Alder and casuarina are examples.

In the cooler parts of Afghanistan, two locusts, (black locust and honey locust) will fix nitrogen. Black locust as a hillside tree has other advantages: its roots are widespreading and produce sprouts which help stabilize loose soil and it is a good source of nectar for bees.

Among the nitrogen-fixing species recommended for Helmand are casuarina, all the acacias, Parkinsonia, sesban, and the saltbush.

Sesban (Sesbania sp.) is remarkable in the fast growth it produces in one season. It is grown in Pakistan as an annual, but there are also perennial species. It can be "plowed under" as an excellent soil builder, the leaves can be fed to livestock, and the dried stems used for fuel.



Gul Karim of Mardan
With Sesbania planting
four months old

Appendix VI: STEM BORERS AND DEFOLIATORS OF POPLARS

I. Poplars in Pakistan and Afghanistan

Two indigenous species of poplar are grown to produce poles and firewood and to sell to manufacturers of matches, boxes, and toothpicks. Populus alba is native to the mountains of the North with their warm summers, cold winters, and fairly high rainfall. Populus nigra grows at a lower elevation that receives from 300 to 750 mm of rain. Populus nigra does quite well when introduced to cooler sites. There are other non-commercialized native species, for example, P.ciliata of the high country and P.euphratica of the coast and low country.

Already introduced and are doing well are **hybrid poplars** which are popular among planters for their rapid growth. Not all fast-growing poplars are hybrids, however. Pakistan Forest Institute has a superior clone of Populus deltoides from which they will supply cuttings to growers.

Because of their fast growth (3 cm in diameter per year) and their wide natural distribution, poplars are grown for building poles by many farmers. When protected from moisture, they make a satisfactory roof support. However, in some areas they will be attacked by termites while in use.

Unfortunately, growing poplars are attacked severely by several species of borers. Mention will be made of five of the common borers, but special consideration will be given to the **Quetta borer**, because it is probably the most serious poplar pest in Afghanistan. It may be that further study will find one or two other borers to be serious pests.

II. Stem borers of poplars

Note: The first two species are moths and the last three are beetles. Only the larvae attack trees.

1. **Carpenter Worm** (Indarbela quadrinotata) primarily attacks bark, but later, the larvae develop tunnels and come out at night to feed on bark. They are not a serious pest unless occurring in large numbers on a single tree.

2. The larvae of the **Clearwing Moth** (Aegeria, spp.) tunnel below the bark of poplars. Irregular knots may be formed as a reaction by the tree. The insect is apparently common in Afghanistan and, in recent years, has probably spread to Pakistan. The trees are not apt to be killed by this insect, but trees weakened by infestations will be easy prey for the more serious Quetta borer, or for the flat-headed borer.

3. The **Flat-headed Borer** (Melanophila picta) does most of its damage just under the bark of poplars, but the older larvae will make tunnels into the sapwood. This beetle is likely to attack a tree that is under stress, so the best protection is to maintain an adequate water supply to trees if possible. (Dr. Ismail Chaudhry, Forest Entomologist at PFI suggests once-a-month watering).

4. The **Pith Borer** (Apriona cinerea) can do extensive damage to poplars in areas where it occurs. In the two-year cycle, the larvae bore from the top of the tree through the pith, making occasional lateral tunnels to the outside. This suggests a method of control in that the larvae are vulnerable to attack by insecticides injected into their lowest lateral tunnel.

5. The most damaging borer in poplars (and in many other tree species) is the **Quetta Borer** (Aeolesthes sarta).It attacks poplars in cold, dry, hilly areas such as occur in much of Afghanistan. The adult, like that of the pith borer Apriona, is a long-horned beetle, distinctive for its long, distinctively-divided antennae that reach past the end of their long bodies which may be 4.5 cm.

The damage to poplars comes from the larvae which, for about eighteen months of the two-year cycle, bore vertically down through the sapwood, occasionally making irregular lateral tunnels to the outside. Their presence is easily detected from the grass and liquid at the outside end of the tunnels. The weakened trees are broken off by winds, greatly reducing their value for building supports.

Control is not easy. Since the larvae are slowly descending their host tree, the lowest exposed holes show where they are working; these bottom holes offer the means of counter-attack. Insecticides in weak solution may be injected into the exposed tunnels, killing the larvae. Even kerosene has proven effective.

Adult beetles emerge between late March and early April. They start laying eggs within about a week of emergence. The eggs hatch in approximately two weeks in late April after which the larvae start drilling into the bark, beginning their damage.

III. Poplar defoliators

Two species of defoliators attack poplars in Pakistan, and it can be assumed they will be present in Afghanistan. They do not damage the wood, but they can slow the growth of trees considerably when their populations are large.

1. A **leaf stitcher**, Gypsonoma hapalosarca is widely spread. It can have up to seven generations in a year which allows fast multiplication. Up to 90% of a tree may have its leaves "stitched" and then eaten from the inside. At other times there will be a sudden drop in the insect population.

The stitchers sometimes prefer one species of poplar over another; their preference for species varies from place to place.

Most of the last generation of the year are destroyed over the winter as larvae in stitched leaves on the ground are used for fuel or livestock bedding. The few larvae that remain on the tree are adequate, however, to start another attack in the spring.

2. The **poplar hairy caterpillar**, Ichthyura anastomosis, is considered less destructive than the leaf stitcher, although occasional serious outbreaks of defoliation have occurred. It can produce eight generations in a year, which allows for rapid expansion. Apparently Populus alba is more resistant to attack than is P. nigra.

IV. Biological control of poplar insects

Birds consume up to 45% of the larvae and adults of the borers. Insects, particularly two species of ants, as well as nematodes, mites and parasitic fungi consume another 5% of the larvae.

Thus the encouragement of predacious ant colonies and the provision of nesting sites for birds can have a beneficial effect in helping lower the number of the poplar borers.

Silvicultural practices such as watering, fertilizing, wide spacing, intercropping with legumes (though less effective in dry conditions), pruning, and weeding all significantly improve tree growth; but these resulting faster-growing trees respond differently to different species of borer and leaf-eater. Attacks by the **Quetta borer** were not significantly affected in tests, but in the case of some other species of borer, attacks were more severe when the trees were most vigorous (or, conversely, the healthier trees might be more resistant to other species of borer). In general the benefits of faster growth outweigh any accompanying risks of borer attack.

Since the two defoliating moths vary their attack on species of poplar, the best defense appears to be to grow more than one species or cultivar of poplar in any plantation.

V. Alternatives to Poplars

Fortunately, there are tree species available for this area which will produce strong building poles, yet are resistant to borers. Several species of eucalypts, particularly *Eucalyptus camaldulensis* and *E. tereticornis* will grow where poplar does, except where the winters are too severe. The recommended species for the coldest zones are black locust and ailanthus. A suitable species for building poles in the driest zone is *E. microtheca*. This species, which can tolerate long periods of drought, has the further advantage of coppicing readily after each cutting. Species of *Casuarina* will also produce straight poles in dry sites, as will the slow-growing ridhwan (*Tecoma undulata*).

References:

ECOLOGICAL STUDIES ON STEM BORERS OF POPLARS, PFI, 1980. By M. Ismail Chaudhry, M. Iqbal Ahmed, and Inayat Ahmed Hafiz

EFFECT OF NATURAL ENEMIES AND SILVICULTURAL PRACTICES ON POPLAR BORERS POPULATIONS, PFI, 1985. By M. Ismail Chaudhry, Director, Entomology

POPULATION DYNAMICS OF TWO POPLAR DEFOLIATORS, PFI, 1973. By M. Ismail Chaudhry and M. Iqbal Ahmad

ECOLOGY AND CONTROL OF ECONOMICALLY IMPORTANT TERMITE SPECIES OF PAKISTAN, PFI, 1980. By M. Ismail Chaudhry and Ashiq Ahmad

Appendix VII: CHECKLIST FOR NURSERIES

NEED FOR TREES LOCALLY

- Economic and ecological conditions
- Interest of people/community participation
- Species to consider: firewood, poles, shade, browse, hedge
- Nursery vs direct seeding on site

OWNERSHIP

- Leased/private/community
- Management of funds (income/expenses)
- Payment of staff (and recruitment if needed)

TRAINING OF STAFF

- Locally/elsewhere

EXTENSION PROGRAM IN VILLAGES

- Awareness/community participation in conservation
- Follow-up (seedling survival)

LOCATION OF NURSERY

- Accessibility/elevation/need for satellite nurseries
- Soil source/soil mixture/need for micorrhyza in soil
- Size and layout
- Shade (maximum and minimum temperatures)
- Water

NURSERY MANAGEMENT

- Funding/staff/record keeping (forms)/pricing
- Number of plants needed (by species)
- Planning month by month
- Source of seed or cuttings/seed treatment
- Need of polythene tubes; and source
- Watering (source/methods/timing)
- Thinning, pruning, shading, fertilizing
- Disease control
- Protection (guards/fence)
- Sale of seedlings (and disposition of funds)
- Gardening/transportation/care and follow-up (survival)

OTHER NURSERY PRODUCTS

- Fruit trees/forage crops/sod/grass seed
- Vegetables in off season?

TECHNICAL SUPPORT
- Supply of tubes or other inputs

MONITORING AND COOPERATION WITH OTHER AGENCIES
- Training/extension/supplies and other programs (energy-saving cooking; housing; health)

SUSTAINABILITY: continuing community participation and support

Appendix VIII: FOREST SEED INVENTORY - OCTOBER 1990

The following seed is stored in the ADT Office, Peshawar.

SEED	AM'T	SOURCE	DESTINATION
Acacia nilotica (Kikar)	1 kg	PFI	Helmand
Acacia modesta (Phulia, Palosa, Akasi)	500 gm	PFI	Helmand
Acacia victoriae	1 kg	PFI	Helmand
Acacia sclerosperma	200 kg	SERVE	Helmand
Casuarina montana	100 gm	PFI	Helmand
Tecoma undulata	100 gm	PFI	Helmand
(Ridhwan, Lahura)	100 gm	PFI	Helmand
Leucaena leucocephala (Ipil Ipil)	500 gm	PFI	Helmand
Parkinsonia, sp.	500 gm	PFI	Helmand
Eucalyptus microtheca	100 gm	PFI	Helmand
E. camaldulesis (Lachi)	200 gm	PFI	Helmand (with trials in Ghazni & Wardak)
Ailanthus sp. (Hindustani bekiana)	200 gm	DFO/Quetta	Ghazni & Wardak

(NOTE: Ailanthus seed should be readily available in Afghanistan.)

SEED	AM'T	SOURCE	DESTINATION
Gleditsia triacanthos (Honey locust)	100 gm	DFO/Quetta	Ghazni & Wardak
Fraxinus exelsior (Ash)	100 gm	DFO/Quetta	Helmand
Pinus halepensis (Persian pine)	2 kg	DFO/Quetta	Ghazni & Wardak and Kandahar
Atriplex canescens (Four-wing saltbush)	300 gm	ICARDA/Quetta	Helmand
Robinia pseudoacacia (Black locust)		Forests Deptt	Ghazni & Wardak and Kandahar

The black locust seed has to be brought from Mansera.

The Ghazni and Wardak sites are too cold for all species listed except for black locust.
Persian pine can apparently withstand temperatures as low as -10^0 C.
Ash, ailanthus, honey locust and <u>Eucalyptus camaldulensis</u> can withstand -5^0 C. Palosa and ridhwan are slightly less frost resistant.
Kikar, after the seedling stage, can withstand some frost.

Appendix IX: INTERNATIONAL SOURCES OF FOREST TREE SEED

1. **OXFORD FOREST INSTITUTE,**
   SOUTH PARK ROAD, OXFORD, OX13RB, ENGLAND
   TELEPHONE: 0865 275 028 or 275 125
   JEFF BURLEY or DR. RICHARD BARNES

2. **AUSTRALIA TREE SEED CENTRE**
   CSIRO, DIVISION OF FORESTRY
   BOX 4008, Q VICTORIA TERRACE
   CANBERRA, ACT 2600, AUSTRALIA
   FAX 6162818312

3. **DANIDA FOREST SEED CENTRE,**
   KROGERUPVEJ A, DK 3050
   HUMELBAEK, DENMARK
   PHONE: 452 190 500 CABLE: FOREST SEED, HUMELBAEK
   ESBEN SCHOLER

4. **NATIONAL TREE SEED PROJECT,**
   NATIONAL TREE SEED BUILDING
   HATTISAR, KHATMANDU, NEPAL
   NARENDARA SHASTRA

5. **ZIMBABWE FOREST TREE SEED CENTRE,**
   BOX HG595, HIGHLANDS, HARARE, ZIMBABWE
   PHONE: 468-78 or 468-79

6. Jean Brouard of **SYLVA GEN** is a good source of information; phone number in Edmonton, Alberta is 403-438-1498.

7. Dr. Peter Huxley of **ICRAF, BOX 30677, NAIROBI, KENYA** is a good source of information on all aspects of agroforestry.

8. Information on nitrogen-fixing trees:
   Jim Chamberlain, Program Officer, Asia & Pacific
   NFTA, Box 680
   Waimanolo, HI 96795

Appendix X: PUSHTO NAMES OF SOME LOCAL TREES AND SHRUBS

SCIENTIFIC NAME	FAMILY	LOCAL NAME
Acacia catechu	MIMOSACEAE	Zanda
A. cyanophylla	"	Jantar
A. farnesiana	"	
A. nilotica	"	Kikar
A. modesta	"	Palosa
Adhatoda vasica	ACANTHACEAE	Bhaikar
Ailanthus	SIMARUBACEAE	Hinustani Bekiana
Aeschulus indica	HIPPOCASTANACEAE	Jawaz
Alnus nitida	BETULACEAE	Giray
Amorpha fruticosa	LEGUMINOSAE	
Bauhinia variegata	LEGUMINOSAE	Kach'nar
Berberis	BERBERIDACEAE	
Bischofia javanica		
Broussonetia papyrifera		(Paper mulberry)
Butea frondosa	LEGUMINOSAE	Palai
Calotropis procera	ASCLEPIADACEAE	Spulmai
Carissa opaca	APOCYNACEAE	Garanda
Cassia	LEGUMINOSAE	Landes
Cordia myxa	BORAGINACEAE	Lashora(Lasura)
Dalbergia sissoo	LEGUMINOSAE	Shisham (Shewa)
Dendrocalamus stricta	POACEAE	Bans
Dodonea viscosa	SAPINDACEAE	Khiraski (S'nata)
Ehretia asper		(w/ red berries) Emblica
officinalis	EUPHORBIACEAE	Amla
Ficus	MORACEAE	Inzar
F. bengalensis	"	Bar
F. religiosa	"	Peepul
Grewia optiva	TILIACEAE	Past'onei
Gymnosporia royleana	CELASTRACEAE	Soor azghai
Ipomea	CONVOLVULACEAE	Gulei basei
Mallotus philippensis	EUPHORBIACEAE	Kambila
Melia azadirachta	MELIACEAE	Bekain
Monotheca buxifolia	SAPOTACEAE	Gurgura
Morus	MORACEAE	Toot
Nanorrhops ritchiena	PALMACEAE	Mazri; Chatai
Olea cuspidata	OLEACEAE	Khona
Otostegia limbata	LABIATEAE	
Periploca aphylla	ASCLEPIADACEAE	
Pinus gerardiana	PINACEAE	Chilghosa
P. roxburgii	"	Chir; Nakhtar
P. wallichiana	"	Kail
Phyllanthus emblica (Emblica offininalis)	EUPHORBIACEAE	Kambila
Pistacia integerima	ANACARDIACEAE	Shinai
Platanus orientalis	PLATANACEAE	Chinar
Prosopis	MIMOSACEAE	Meskiit
Plectranthus rugosus	LABIATEAE	Shaim
Pyrus pashia	ROSACEAE	Batangi
Quercus	FAGACEAE	Banj; Serai; Sedai
Reptonia buxifolia (Monotheca buxifolia)	SAPOTACEAE	Gurgura
Rosa moshafa	ROSACEAE	Kintai
Rubus ellipticus	ROSACEAE	Gorach
Rumex hastatus	POLYGONACEAE	

Salmalia malabarica	BOMBACACEAE	Bombeh
Sapindus muckrossii	SAPINDACEAE	

SCIENTIFIC NAME	FAMILY	LOCAL NAME
Solanum xanthocarpum	SOLONACEAE	
Tecoma undulata	BIGNONIACEAE	Ridhwan
Vitex negundo	VERBENACEAE	Marwandi
Zizyphus jujuba	RHAMNACEAE	Ber
Z. nummularia		Kharkana

SOME GRASSES

Avena fatua	Jandar (wild oats)
Cynodon dactylon	Kabal (bermuda)
Heteropogon contortus	Surmal (needlegrass)
Imperata cylindrica	Drab (speargrass)
Panicum antidotale	Mala
Pennisetum purpureum	(Napier grass)
Phalaris minor	Ghokht
Saccharum sp.	Sha rashe
S. filicifolium	Kahe

Appendix XI: AGENCY & PERSONNEL LIST/AGROFORESTRY
October 1990

1. Malakand Social Forestry Project
   Box 9, Saidu Shariff 0536-5786
   JAN HELSEN , Extension Specialist
   JOHAN NIEUWENHUIS, Training Specialist
   ZARNIGAR A TAYIB (Forester), Women's Programs

MFSP has a successful program that involves villagers in planning and implementing the planting and protecting of hillsides. Their involvement with schools is noteworthy.

2. GTZ PAK/German Integrated Rural Development Project
   Box 61, Charsadda Road, Mardan 0531-62653
   HELMUT IRLE, Project Coordinator
   OTHER STAFF in forestry, livestock, women's programs, etc.

The Mardan IRD Project includes forestry for women and for men. It is a people-oriented project.

3. SERVE
   6 Mulberry Road, Box 477, Peshawar 41706
   ROSS HALIBURTON
   HERMAN NYHOFF, Forester

Work in refugee camps. Small private nurseries. Tree seedlings available for other people or groups.

4. MADERA
   Peshawar, 42234
   OLIVIER COSSEE, Forester

Project in forest management and training in Kunar Province. Involves local people in managing their own forests for sustained yields. Training materials available. (They use a battery-powered projector.)

5. GTZ
   31-c Circular Road, Box 896, Peshawar 42511
   CORNIE HUIZENGA, Chief Technical Advisor
   PHILIP APPLETON, Technical Advisor
   MARYAM BIBI, Energy Education Advisor
   WILFRIED HERRICH, Chief Technical Advisor and many others

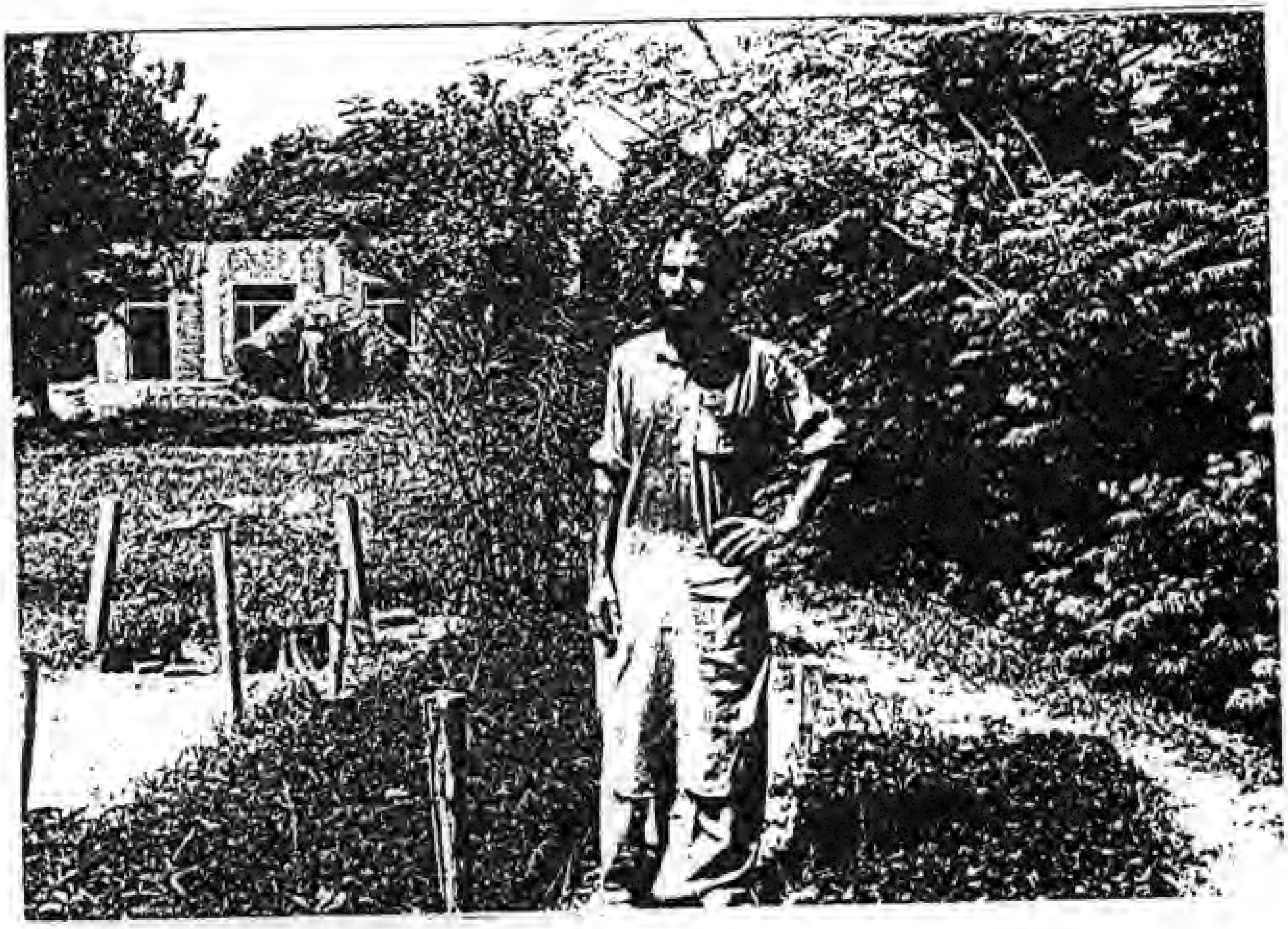
Energy-saving projects; efficient stoves; buildings without wood in the roof; training materials designed for Afghanistan and for Pakistan.

6. SARHAD RURAL SUPPORT CORPORATION
   House #22, Street 2, Shami Road, Peshawar 73731
   JAVID MAJID
   JAVAID HASSAN
   MOHAMMAD SARTAJ

SRSC is not directly engaged in forestry projects. They help rural populations "achieve self-sustaining development."

7. PAKISTAN FORESTS DEPARTMENT
   Shami Road, Peshawar

The **Maroof** nursery in **Kandahar is lower and warmer. At 1700 meters** it is in the so-called Pistachio Zone with **rainfall between 250 and 400 mm** per year. **Winter temperatures are below freezing.** The wild pistachio, <u>Pistacia atlantica</u>, once grew abundantly here, along with a wild almond. (The pistachio of commerce, <u>Pistacia vera</u>, grows only in western Afghanistan at a lower elevation).



Orchardist in Malakand
with private nursery
and windbreak

The project does not yet have a nursery in **Nangarhar** which is higher, colder and wetter than the other sites.

In the hot, dry **Helmand Valley,** a nursery is being started, with seed to be planted in early 1991. In Helmand the **rainfall is less than 150 mm,** but irrigation water is available. **Temperatures may drop below freezing in January.**

YARYAH M. KHAN, Chief Conservator 78674

8. PAKISTAN FOREST INSTITUTE
DR. SIDDIQI, Director
DR. A. R. BEG, Forest Botanist
DR. M. ISMAIL CHAUDHRY, Forest Entomologist
RAJA WALAYAT HUSSAIN, Director, Forest Research
ANWAR AHMAD KHAN, Botanist, Medicinal Plants

PFI offers helpful advice on forestry problems. They have a large seedbank from which they will supply tree seed; and they will provide training in specific subjects.

9. CARE International
Box 926, Peshawar 43875 45217 45317
DALE HARRISON, Chief of Mission
Dale can provide valuable help in training.

10. AUSTRIA RELIEF COMMITTEE
80-D Park Road, Peshawar 42592 42584
NOOR AQA, In charge of Rural Development

ARC has fruit-tree nurseries and poplar cuttings in Ghazni and at Marof in Kandahar.

11. IRC
41-F SAQ road, Peshawar, 41274
BOB BOUVIER

IRC has nurseries in Paktya Province with fruit and pine trees.

12. FAO
Islamabad
ANTHONY FITZHERBERT

FAO has supplied fruit trees and cuttings of poplars to agencies working in Afghanistan.

13. PAK/GERMAN SELF HELP PROJECT FOR RURAL DEVELOPMENT-BALUCHISTAN
18-B Railway Housing Society, Box 233, Quetta 74950
DR. PAUL LUTZ, Director

A people-oriented village development program. ADT staff would be welcome to visit when in Quetta.

14. FORESTS DEPARTMENT
Quetta
GHIAS UDDIN AHMAD, Chief Conservator 74271
MOHAMMAD YUSSUF, District Forest Officer
ALTAF HUSSAIN, Regional Forest Officer (Nursery)

The nursery has plants suitable for Helmand and Kandahar. It will provide seeds, also.

Liste

des essences ligneuses (arbres, arbustes et petits arbustes) en Afghanistan

Nom latin des essences	Famille	Noms afghans ou pachtou des essences
1	2	3
Abies webbiana, (Wall.) Lindl. =	Pinaceae	Bijour
A. spectabilis, (D.Don.) Spach.	"	"
Acacia modesta, Wall.	Mimosaceae	Akasi
Acantholimon cabulicum	Plumbaginaceae	
Acer caesium, Wall.	Aceraceae	Siah tchoub
A. campestre, L.	"	"
A. oblongus, L.	"	"
A. pseudoplatanus, L.	"	"
A. semenovii	"	"
Aellenia subaphylla, C.H.Mey.	Chenopodiaceae	
Ae. glauca	"	
Aesculus indica, Colebr.	Hippocastaneae	
Ailanthus glandulosa, Desf.	Simarubaceae	Bed roussi
Albizzia lebek	Mimosaceae	Akasi
A. mollis	"	"
Amorpha fruticosa, L.	Papillonaceae (Fabaceae)	Akasi Japan
Amygdalus buharica, Korsh.	Rosaceae	Badami Kouh
A. cf. communis, L.	"	"
A. kuramica, Korsh.	"	"
A. brahuica, Boiss.	"	"
A. eburnea, Spach.	"	"
A. erioclada, Bornm.	"	"
Artemisia Herba-alba, Asso	Compositae	
A. annua, L.	"	

1	2	3
A. speciosus	Compositae	
A. absinthium, L.	"	
A. persica, Boiss.	"	
Astragalus erionotus, Boiss.	Leguminosae (calycosystis)	
A. mokurensis, Sirj. et Rech.	"	
A. terrestris, Kitm.	"	
A. speciosus	"	
Atraphaxis spinosa, L.	Polygonaceae	Parpa tchar
Berberis aristata, L.	Berberidaceae	Sirk
Berberis vulgaris, L.	"	" Zirishk
Betula utilis, Don. = B. bhojpatra Wall.	Betulaceae	Rima
Bombax malabaricum, D.C.	Bombacaceae	Simal
Caillonia speciosus	Rubaceae	
Calligonum amoenum	Polygonaceae	
C. bungei	"	
C. intertextum	"	
C. molle	"	
C. commosum	"	
C. turkestanicum	"	
Callistemon speciosus, D.C.	Myrtaceae	
Calotropis procera, D.C.	Asclepiadaceae	
Caragana brevispina, Poger.	Papillonaceae (Fabaceae)	
Catalpa spp.	Bignoniaceae	Katalpa
Cedrus deodara, (Roxb.) Loud.	Pinaceae	Artcha
Cedrela toona, Roxb.	Meleaceae	Ton
Celtis caucasica, Willd.	Ulmaceae	Tartchum-Taghar

1	2	3
Cerasus bifrons, Fritsch.	Rosaceae	
Cercis griffithii, Stocks	Mimosaceae	Arghouan
Chamaerops Ritchieans, Griff.	(Palmae)Arecaceae	Moundj
Citrus medica, Linn. var. limonum	Rutaceae	Lemon
C. acida	"	"
C. decummana, Linn. = C. grandis, C. maxima	"	"
Clematis orientalis, Linn.	Ranunculaceae	"
Colutea orientalis, Miller	(Papillonaceae) (Fabaceae)	
C. persica, Boiss.	"	
Cornus capitata, Wall.	Cornaceae	
Corylus colurna, Linn.	Betulaceae ou Corylaceae	
Cotoneaster bacillaris, Aitchison	Rosaceae	Chirchecht
C. intererrina, Mod.	"	"
C. nummularia (non F. et M) Aitchison	"	"
C. species	"	"
Crataegus monogyna, Jacq.	"	Tchakadarna
C. oxycantha, L.	"	"
C. songarica, C. Koch	"	"
C. turkestanica, A. Pojark	"	"
Cupressus torulosa, Don.	Cupressaceae	
Cynanchum geaucum, Wall.	Asclepiadaceae	
Dalbergia sisso, Roxb.	Fabaceae	Chicham
Daphne angustifolia, Koh	Thymelceaceae	
D. mucronata, Bayle	"	
D. oleoides, Schreb.	"	

suite

1	2	3
F. syriaca, Boiss.	Oleaceae	Chang
F. xantholoides, Wall.	"	"
Gleditschia triacanthos, L. var. forx.	Mimosaceae	Badal
Grevillea robusta, Linn.	Protaceae	
Grewia oppositafolia, Roxb.	Tiliaceae	Paslaone
Gymnosporia royleana, Laws.	Celastraceae	
Haloxylon ammodendron, Boiss.	Chenopodiaceae	Saxaoul
H. persicum, Bgl. et Boiss.	"	"
H. salicornicum (Moq.) Bgl.	"	"
Hedera himalaica	Araliaceae	
Hibiscus syriacus, L.	Malvaceae	Ghoultout
Hippophae rhamnoides, L.	Eleagnaceae	
H. salicifolia, Don.	"	
Indigofera gerardiana, Wall.	Papillonaceae	Hatriz
Jacaranda mimosaefolia	Bignoniaceae	Jacaranda
Jaasminum revolutum, Sims.	Oleaceae	Jasmin
Juglans regia, Linn.	Juglandaceae	Tcharmas
Juniperus macropoda, Boiss. = J. excelsa, Brandis	Cupressaceae	Cedar obakht
J. polycarpus; C. Koch	"	"
J. communis, L. var. montana, Ait. var. nana	"	"
J. semiglobosa	"	"
J. seravschanica, Kom.	"	"
J. specius recurva, Buch. Ham	"	"
Leptonia spartium	Asclepiadaceae	
Lonicera Griffithii	Caprifoliaceae	Olinoj
L. nummularia	"	"
L. obovata	"	"
L. sericea	"	"

1	2	3
Loranthus europaeus, L.	Loranthaceae	
Lycium	Solanaceae	
Magnolia	Magnoliaceae	
Malus baccata, Desf.	Rosaceae	Siib Saib
M. turkmenorum	"	"
Melia azedarach, Linn.	Meleaceae	Nim
Morus indica	Ulmaceae	Tut
Morus alba, Linn.	"	"
Morus nigra, Linn.	"	"
Nerium odorum, Soland.	Apocynaceae	Oleander
Nitraria schoberi, L. = N. caspica, Wild.	Zygophyllaceae	
Olea cuspidata, Wall. = O. ferruginea, Royle	Oleaceae	Zeytoun
Ononis spinosa, L.	Papillonaceae	
Padus cornuta, Wall. et Royle		
Paliurus spina-christi, Mill. = P. aculeatus, Lam.	Rhamnaceae	
Periploca aphylla, D.C.	Asclepiadaceae	
P. graeca, L.	"	
Perowskia atriplicifolia, o [illegible] Benth	Nyctaginaceae	
Phoenix dactylifera, Linn.	Palmae	Khourme
Photinia japonica, Gray	Rosaceae	
Picea morinda, Link. = P. smithana, Boiss.	Pinaceae	Seroupp
Pinus gerardiana, Wall.	"	Jalghoza
P. excelsa, Wall. = [illegible]	"	Nechtar
P. wallichiana, A.B. jadis	"	Nadjou
Pirus communis, L.	Rosaceae	Naak
P. persica, Persoch	"	Naak

suite

1	2	3	
Pirus salicifolia, L.	Rosaceae	Najam, Charkandi	
P. lahata	"	Naak	
P. malus, L.	"	Siib	
P. korshinsky	"	"	
Pistacia khinjuk, Stochs. var. Populifolia, Boiss.	Anacardiaceae		
P. mutica, F. et M. = P. terebinthus, Bieb. = P. atlantica var. latifolia D.C.	"		
P. vera, Linn.	"	Pista	
Platanus orientalis, Linn	Platanaceae	Panjatchenar	
Polygonum balodschuanicum, Regl.	Polygonaceae		
Populus alba, Linn	Salicaceae	Safidar	white
P. euphratica, oliv. = P. ariana, Dode	"	Pata	
P. cilliata, Wall.	"	Tchenar Cottonwood	
P. nigra, L. var. italica (munchh.) Koehne = P. pyramidalis, salisb.	"	"	
Potentila davurica, Nestler	Rosaceae		
Prosopsis stephaniana, Spreng	Mimosaceae	Djereng	
P. spicigera, L.	"		
Prunus avium, L. = Cerasus avium, Moench.	Rosaceae	Guilas	
P. cerasus, L. = Cerasus caponica, Boiss.	"	Alu Balu	
P. communis, Fritsch = Amygdalus communis, L.	"	Badami Kuoh	
P. persica, C.A.M. = Amygdalus persica, L.	"	Chaftalou	
P. padus, L.	"		
P. armenica, L.	"	Zardalou	
P. domestica, L.	"	Alu	

suite

1	2	3
Punica granatum, Linn.	Punicaceae	Anar
Quercus Baloot, Griff. = Q. ilex, Linn.	Fagaceae	Balut-serai
Q. dilatata, Lindl.	"	Morou
Q. semicarpifolia, Smith	"	Katchou
Reptonia buxifolia, A.DC	Myrsinaceae	Gourgour
Rhamnus pallasii, F.etM	Rhamnaceae	
Rhazia stricta, Decnl.	Apocynaceae	Gonderey
Rhododendron afganicum	Ericaceae	
R. colletia	"	
Rhus typhina, L.	Anacardiaceae	Goulbad
R. cotynus, L.=Cotynus coggygria, Scop.	"	
Ribes orientalis, D.S.F.	Saxifragaceae	
R. alpestre	"	
R. grossularia, L.	"	
R. rubrum, L.	"	
Robinia pseudoacacia, L.	Papillonaceae	Akasi
Rosa seriaca, Lindly	Rosaceae	Goulab
R. anserineafolis	"	"
R. ecea	"	"
Rosa lutea, Miller	"	"
Rosa persica	"	"
Rubus caesius, L.	"	"
Rubus sanktus, Schreber = R. anatolicus, Focke	"	"
Sageretia brandrethiana, Aitch.	Ramnaceae	Momanna
Salix acmophylla	Salicaceae	Bed
S. angustifolia	"	"

1	2	3
Salix babilonica, Linn.	Salicaceae	Madjnun Bed
S. daphnoides, Will.	"	Bed
S. elegans, Wall.	"	"
S. fragilis, Linn.	"	"
S. grisea	"	"
S. sericicarpa	"	"
S. tetrapserma, Roxb.	"	"
S. Wallichiana, And.	"	"
Salsola arbuscula, Pall.	Chenopodiaceae	
S. incanescens, C.A.Mey	"	
S. subaphylla, C.A.Mey	"	
Sambucus wightiana, Wall. et Wight	Caprifoliaceae	
Schinus molle, L.	Rosaceae	[illegible]
Sophora alopecuroides, L.	Papillonaceae	Boujar
S. Griffithii, Stocks	"	"
S. japonica, L.	"	"
S. martensis, Boiss. Red	Rosaceae	
S. mollis, Graham	Papillonaceae	Boujar
S. pachyleda	Rosaceae	
Sorbaria Lindleyanan, Maxim	Rosaceae	
Sorbaria tomentosa, Lindl.		
Spirea brahuica, Boiss.	Rosaceae	
Stocksia brachnica, Benth.	Sapindaceae	
Syringa vulgaris, L.	Oleaceae	
Tamarix gallica; L.	Tamaricaceae	Chingasei
T. gallica, L. var. Pallasii, Auct.	"	"
T. salina, Dyer	"	"

CHAPTER 2: FORESTNURSERIES

Some Considerations

- Private poplar nurseries already exist.
- The war prevented replanting in some of those nurseries.
- Nurseries should be privately owned, but plantations may need public support.
- In most areas there seems to be no precedent of growing firewood for its own sake.
- Because of the damage done to poplars by borers, and possibly by defoliators, additional species are recommended for poles.

A. Choice of Species

A study of the original natural vegetation of these sites (where there are ASSP nurseries) indicates that fruit and nut trees can be expected to thrive. The climate and the preferences of the local growers will determine the choice of **forest** species. Suggestions of tree species for various needs are as follows:

1. **Hedges: Russian olive** (Eleagnus angustifolia). This versatile small tree will grow at all the elevations and varying environments of the Project area and is already familiar to farmers. Its clippings are a source of fuel. Seed is gathered locally.

2. **Building poles** (quick-growing): During peacetime, the poplar is the tree that farmers chose for building poles. Poplar poles are reportedly grown commercially in some Northern provinces and shipped to other areas. Tall species of **willow** (Salix, sp.), **black poplar** (Populus nigra), and **white poplar** (Populus alba), along with **hybrid poplar** will do well at these cool elevations.

Several species of borer readily attack poplars. For this reason, other species of slower-growing trees such as **black locust** (Robinia pseudoacacia), **Hindustani bekiana** (Ailanthus glandulosa), and perhaps one of the eucalypts will be included.

Local cuttings, as opposed to rooted cuttings from a nursery, are the best choice to produce poplars, since Afghan farmers prefer to receive cuttings which they plant on their own sites.

3. **Fuel:** Branches and thinnings from plantations of **black locust, Russian olive, ailanthus, mulberry and willow** are good for fuel. Two dense and slow-growing firewoods, **palosa** (Acacia modesta) and **ghoraski** (Dodonea viscosa) should be grown at lower and warmer elevations in Kandahar.

Mulberry can grow from seed, but the seedlings will be much more valuable if grafted with a domestic variety to produce large fruit.

suite

1	2	3
Tamarix stricta dioca, Rob.	Tamaricaceae	Chingasei
T. troupii	"	"
T. tetragyna, C.A.M.	"	"
T. articulata, Vahl. = T. aphylla(L) Karsten	"	"
T. tetandra, Pall.	"	"
Taxus baccata, Linn. subsp. Wallischiana, Zucc	Taxaceae	
Tectonia grandis, L.	Verbanaceae	
Thuya orientalis, Linn.	Cupressaceae	
Triaspis	Malpighiaceae	
Ulmus campestris, L.= U. carpinifolia, Gleditsch	Ulmaceae	Pacha Tchana
U. montana, Smith=U. glabra, Huds.	"	"
U. wallichiana, Plach.	"	"
Viburnum cotinifolium, Don.	Caprifoliaceae	
Viscum album, L.	Loranthaceae	
Vitex agnus castus, L.	Verbanaceae	
Vitis vinifera, L.=V. silvestris, Gmel.	Vitaceae	Angour-i-Kouh
Withania coagulans, Stocks	Solanaceae	Khmazoura
Zizyphus vulgaris, Lam.	Rhamnaceae	Onab
Z. mauritania, Lam.	"	"
Z. nummalaria, W. et A.	"	"
Z. jujuba, Mill.	"	"
Z. spina-christi	"	"
Zygophyllum atriplicoides, F. et M.	Zygophyllaceae	Merghailan
Z. tetrapterum	"	"

4. **Erosion control: All the fuel-wood species**, especially the legumes, act to protect the soil. **Other native shrubs and trees such as wild almond, Cercis (a legume)**, and **Artemisia**, along with **grasses**, can help reclaim eroded hillsides. Strict **control of grazing** and browsing is essential. Controlled grazing allows plants to produce more biomass than is being consumed--it does not mean "no grazing".

5. **Timber:** Landowners who look ahead to producing lumber in the next generation should consider **Persian pine** Pinus halepensis. Realistically, it will be unlikely that such a long-term crop would be widely planted during these unsettled times, although it is popular as a decorative tree. (If a nursery is started in Nangarhar, other conifers like **cedar**, Cedrus deodara, are recommended).

6. **Windbreaks: Most species** of the trees already mentioned are suitable for windbreaks. In areas where the wind is strong, the windbreak should have at least three rows perpendicular to the wind, with the tallest species in the middle row. For example, **locust or mulberry** could be sandwiched between rows of **Russian olive.** Or a fifth, taller middle row of **poplar or ailanthus** could be added.

Several species are **multi-purpose trees. Mulberry** is versatile with its production of good lumber, fuelwood, and fruit (that can be eaten fresh, or dried for later use or sale). **Black locust, ailanthus,** and any of the **acacias** provide leaves for animal feed.

B. New Nurseries

1. **Helmand**

In order to provide trees for farmers in Helmand, a nursery is being established there. The choice of species so far has been determined by a greater need locally for poles rather than for firewood. Fuelwood is available from the prunings of fruit trees and from willow, tamarisk, and probably the low native poplar, Populus euphratica.

The choice of species is affected further by whether or not the trees will be grown on irrigated land. The nursery will provide the drought-resistant species **Parkinsonia, Eucalyptus microphylla, Casuarina montana and Tecoma undulata. Eucalyptus** (E. microphylla) can withstand many months of drought. It has the further advantage of sprouting readily after cutting.

Another drought-resistant species, **tamarisk** (Tamarix aphylla) will be promoted outside the nursery through cuttings. All the drought-resistant trees will, of course, grow faster if they receive irrigation.

The nursery has seed of a few semi-tropical trees that will require some irrigation: **three acacia species (A.nilotica, A.modesta, and A.victoriae)** and, **Eucalyptus camaldulensis** (for poles).

In any area in the valley where fuelwood might be needed, **leucaena** and **sesban** are recommended. These valuable tropical legumes produce both fodder and fuel. Sesban (Sesbania sesban) is an annual crop that produces large amounts of foliage and is used as fodder or as green manure. The dried stems are a cash-crop fuel. This salt-tolerant crop will require some irrigation, as will the leucaena.

Four-wing saltbush (Atriplex canescens) is a native of the dry parts of Australia and will tolerate saline soils and very low rainfall. Recommended primarily for fodder, over half of the plant is woody and a source of fuel.

The native wild melon Citrullus colocynthis is being studied as a source of fuel from its roots. Since this plant is a good soil binder and grows where no other fuelwood plant can easily survive, it can be encouraged. Reports indicate that colocynth has a wide range in the dry areas of the South and West. (See Appendix II).

Mention should also be made of a popular firewood gathered from the desert in Helmand. **Saxaoul** (Haloxylon ammodendron), one of the chenopods, produces a short, dense stem that makes excellent firewood. It has not been cultivated specifically as a fuel crop. It is said to have the further attribute of coppicing.

In the nurseries, seeds of most species can be planted almost any month (except winter in the cold sites), but one has to look ahead to avoid having tender plants exposed in the cold season. Timing is critical in producing seedlings of good size, available for planting when the rains begin.

3. Nargarhar

At the higher elevations in Nangarhar one would expect oak or even cedar forests. Indications are that most of the original climax forests have been destroyed, replaced by wild indigo (Indigofera gerardiana) which resists overgrazing. Rebuilding these valuable forests would be commendable, but that lies outside the realm of the present project. **Olive** and **oak** are possibilities for fuel wood, but they are very slow-growing compared to **black locust** and the **poplars** which will also grow there. The Project has no plans for a nursery in Nangarhar province at present.

C. Nursery Costs

Forest nurseries for private or communal land should generally be **small, privately owned, and as close to the planting site as possible.** One outside cost that has to be considered is that of the polythene planting tubes. Although many of the recommended species can be grown as "bare-root" cuttings or seedlings (and planted early in the growing season), there is a need for the tubes for the nondeciduous species as well as for the acacias. The large number of Russian olive seedlings needed for orchard hedging would benefit from a start in tubes. In Helmand, most of the plants will be raised in tubes.

Bare-root nurseries, with their raised beds, can accommodate approximately 70,000 plants per acre, whereas a tubeling nursery can hold a few hundred thousand trees.

D. Budget for Nurseries

The suggested budget is for one year. It is the cost of expansion by four jeribs (two acres) at each of seven operating fruit-tree nurseries, plus the cost of adding two acres of new nursery in Helmand.

Production should be around 160,000 seedlings per nursery. (It could be much higher in Helmand if intensive tree production is needed).

LEASE OF LAND: 16 acres @ Rs5000	Rs80,000
LABORERS: 16 @ Rs1000/mo; 12 months	192,000
SEED & CUTTINGS :	16,000
POLYTHENE TUBES: 40 kg @ Rs50	2,000
TRANSPORTATION OF TUBES:	10,000
TOTAL	Rs200,000

Dicussion of poplars: Some superior clones of poplar are available in Peshawar, at the DAI/ADT nursery in Darra, as well as at the nursery at the Forest Institute.

I would not suggest moving more than a few poplar cuttings to Afghanistan, unless the ADT staff there determine that there is a need and a demand for them. The information available so far indicates that cuttings can be made in Afghanistan from local trees that the farmers like.

The nurserymen should be **trained** to help where necessary in planting (for example, at the right time of year, and with the right techniques). Any community is likely to have experienced growers of poplars.

CHAPTER 3: WATERSHED MANAGEMENT IN AFGHANISTAN

One aspect of forestry that needs consideration is the serious deterioration of vegetative cover on the hills and mountains in Afghanistan. There are people who remember when some of the presently-barren hills were once covered with forests. Indications are that the coniferous forests along the border in Paktya (and Kunar) are rapidly being removed as new roads make the timber accessible.

Botanists studying the natural vegetation find vast areas covered with indicators of overgrazing; such plants include unpalatable species such as Artemisia, Indigofera and Hierochloe (in Alpine meadows). Dr. A. R. Beg of the Forest Institute reported in 1968, how thorny species of Acantholinum and Cousinia have replaced valuable forages as a result of overgrazing and the uprooting of plants for fuel.

The loss of trees, shrubs, and grasses has resulted in a reduction in the capacity of the soil to retain the scarce moisture from the low annual precipitation. The soil itself is washed away, and what remains suffers from lowered fertility. Damage by flooding or from landslides is also increased. A further concern is the silting of catchments behind dams.

Hillside degradation extends far beyond Afghanistan, of course. In Pakistan some success in overcoming this problem through community effort has been achieved in the NWFP and elsewhere. The following factors should be considered to protect and rehabilitate degraded slopes:

Social Factors

- The relationship between crop-growers and the owners of grazing or browsing animals.

- The type of ownership or terms of use by farmers (for example, the land-tenure system).

- The opportunity for short-term income from changed practices (considering also risks, labor, and expenses involved). A specific local example is the income available from the sale of hay from a protected area. It is important to realize that a protected ecosystem has to contribute to the economy in order to survive.

- Community-wide participation, working through local leadership. (The migrant livestock herders must ultimately be included, perhaps in a "livestock association.")

Technical Factors (Must be in harmony with social factors).

- Suitable species of trees and other plants, including grasses, should be available for planting.

- Nurseries, as needed, have to mesh with the program.

- Control of water-flow by means of terracing, contouring, mulching, and checkdams may be necessary. These structures may be expensive.

- The goals include the increase and distribution of better quality forage, along with a return to forest-cover where appropriate. (For instance, it requires 500 mm or more of rain to support a forest).

Protection of slopes is a separate, but vital, issue. Plantings of trees, shrubs and grasses have to be protected from livestock and, perhaps, from people as well. **The only workable method of protecting hillsides is the determination of the total community to see the program succeed.** They then make their own regulations. One immediate and visible benefit from a protected site is the income from the sale of hand-cut forages. Rather than to collect grazing fees, cut grass or hay is sometimes sold to nomads or other former grazers. Longer protection brings increasing income from this source after the first few years. Having a nearby source of fuelwood (from thinnings and prunings of a forest plantation) becomes a convincing demonstration of the benefits of reclaiming the land.

Merely **protecting** some hillsides will allow recovery of vegetation from formerly suppressed grasses and woody plants without any replanting. There is a "mulch factor" to consider, also; degraded sites improve more rapidly when none of the biomass is removed.

Although the present situation in most areas of Afghanistan is not conducive for villagers to participate in any large-scale program to rehabilitate eroded hillsides, this should not prevent attempts to accomplish some erosion control. There are reports of noteworthy improvements in vegetative cover around protected military sites in **Wardak** province. A community-supported forest management project in Madera in **Kunar** Province is also successful.

Accurate data are not easily available on the present ecological status of Afghanistan. In each area where there is an ADT program, the social and ecological situation should be assessed to see what help the local people need in preserving and improving their hillsides. (Include other areas when possible and exchange data with other agencies working in Afghanistan).

Trees for Poles and Lumber

Poplar is the present choice as a building timber in most of the country, although stronger wood would be used if it were available. Poplar is grown in most provinces, but the war has reduced commercial production. An additional concern is the attack on poplars by beetle larvae. The suggested species to supplement poplar is the borer-resistant black locust which can thrive in cold sites. The most promising conifer for low-rainfall areas is the Persian Pine (*Pinus halepensis*).

Insects of Poplar

The promotion of poplar should continue. The best protection from insect attack is to grow several species--to avoid a monoculture. Black poplar, white poplar, and clones of hybrid poplar are good choices. Using sources from within Afghanistan is preferred over transporting costly cuttings from Pakistan; but in some areas the latter course may be necessary.

Fuelwood

It is rare to grow fuelwood as a crop, but the planting of multi-purpose trees with firewood as a by-product has merit.

Helmand Valley

One or more forest nurseries are starting in Helmand. Because of its mild climate, Helmand can grow a wide variety of trees.

Forestry Association

Peshawar has an interest in establishing an informal association of foresters and other interested land-use professionals. Such a move will strengthen the efforts to meet Afghanistan's need for trees and for good hillside management.

The Appendices

The 30 page appendices present background information on forests and range as it applies to Afghanistan.

Looking Ahead

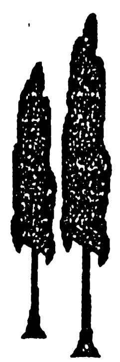
The immediate goals of the ADT section of the project are to expand the activities of nursery staff working in Afghanistan. They will introduce and make available forest species useful to their areas. Initial concerns will be with trees for firewood and building poles, but they will also initiate moves to involve local farm families in watershed conservation.

The larger problem of halting and reversing the degradation of hillsides must involve other agencies working in Afghanistan. This is a long-term effort, made difficult by political conditions, but essential for the future well-being of the people of Afghanistan.

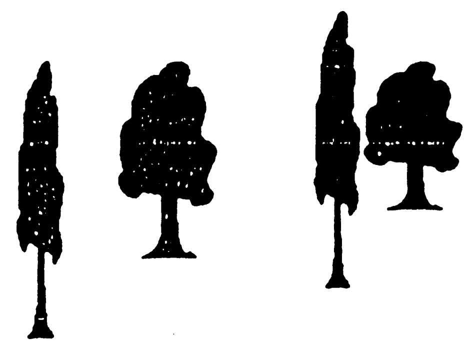

U.S.S.R
IRAN
PAKISTAN
AFGHANISTAN
KUNDUZ
BADAKSHAN
TAKHAR
BALKH
SAMANGAN
BAGHLAN
FARYAB
JOWZJAN
BADGHIS
KAPISA
KUNAR
PARWAN
LAGHMAN
BAMYAN
KABUL
WARDAK
HERAT
GHOR
LOGAR
NINGRAHAR
ORUZGAN
PAKTYA
GHAZNI
FARAH
PAKTIKA
ZABUL
HELMAND
KANDAHAR
NIMROZ
ADT activity
ADT nursery



AGROFORESTRY



IN



AFGHANISTAN



Agroforestry in Afghanistan

Agricultural Sector Support Project
Private Sector Agribusiness

Development Alternatives, Inc.

AGRICULTURAL SECTOR SUPPORT PROJECT
PRIVATE SECTOR AGRIBUSINESS

Agroforestry in Afghanistan

Agricultural Sector Support Project
Private Sector Agribusiness

Prepared by Lester Ezar Bradford for Development Alternatives, Inc., for the office of the AID Representative to Afghanistan under Contract Number 306-0204-C-00-9829-00.

Peshawar, Pakistan

October 1990

Development Alternatives, Inc.
4 A-C Park Avenue, University Town, Peshawar, Pakistan

AFGHANISTAN AGRICULTURAL SECTOR SUPPORT PROJECT
PRIVATE SECTOR AGRIBUSINESS

AGROFORESTRY IN AFGHANISTAN

PREPARED BY
LESTER EZAR BRADFORD
FOR
DEVELOPMENT ALTERNATIVES, INC.,
FOR
THE OFFICE OF THE AID REPRESENTATIVE TO AFGHANISTAN

PESHAWAR, PAKISTAN OCTOBER 1990

AGROFORESTRY IN AFGHANISTAN

TABLE OF CONTENTS

APPENDICES

Note: Appendix XII is a copy of ten pages from Etude Dur La Classification Ecologique De La Vegetation Ligneuse Naturelle En Afghanistan, 1973 by Professor S. T. Nedialkov. (Project UNDP/FAO/AFG 67/515)

AGROFORESTRY IN AFGHANISTAN

SUMMARY AND RECOMMENDATIONS

A Need for Trees

The shortages of fuelwood and of building poles in Afghanistan are the primary concerns of this study, along with the serious problem of eroded hillsides.

Nurseries and Agroforestry Efforts

The Afghanistan Agricultural Sector Support Project's Agricultural Development and Training (ADT) staff are working in fruit tree nurseries in three provinces of Afghanistan, and it is with them initially that the agroforestry efforts are concentrated. Nurseries should expand to include trees for fuel, poles, windbreaks, and land reclamation. Nurserymen will demonstrate the uses of the introduced trees and involve the local people in decisions on their use.

Training

Recommendations are that the nursery staff receive training during their normal winter sojourn in Peshawar. Training is necessary to familiarize nursery staff with the administration of a forest nursery and with the silviculture of trees suitable to their localities.

Training should include: 1) the social aspects of forestry; 2) ways of involving the local people in choosing the species they want; and 3) methods of working jointly on community-wide ecological problems.

The training staff of ADT will conduct the training in close cooperation with other agencies.

The Environment and Environmental Awareness

The need for watershed forestry is acute; however, the political situation precludes much opportunity for attacking the problem just now. One important and attainable activity is to **introduce the concepts of resource conservation into the schools.** Project managers also need to mobilize adults to work together to attain controlled management of eroding hillsides.

Surveys Needed

More information is acutely needed about rural Afghanistan. Data are needed not only on the extent of the crisis in wood shortages, but on the attitudes of the people toward tree planting and on their solutions to the present shortages.